

Remarks/Arguments:

Claims 1-39 are in the Application. The original Application is now under FINAL REJECTION. A Petition for an Enlargement of Time to respond in the sixth (6th) month, a Declaration of Laszlo J. Kecskes in support of this Amendment and a Request for Continued Examination, with appropriate fees, are filed concurrently with this Amendment.

Claims 34-39 were rejected under 35 U.S.C. § 112 because these claims ...encompass large numbers of materials that would not be in accord with the description of the invention set forth in the originally filed specification." Claims 1-15, 30 and 31 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wolter (PG Pub. No. 2003/0217790). Claims 1-8, 11-15, 30 and 31 are rejected under 35 U.S.C. § 103(a) over Xing et al. (PG Pub. 2002/0036034). Claims 1-39 are provisionally rejected on the ground of non-statutory obviousness-type double patenting over Claims 152-160 of co-pending Application No. 10/946,132.

Applicants respectfully traverse each and every rejection and/or objection to the Claims of the Application. Applicants acknowledge the withdrawal of the rejections based on Lin and Senkov. The Examiner is thanked for the withdrawal. Further, Applicants acknowledge the continued rejection over Xing.

Claims 34-39 were rejected under 35 U.S.C. § 112 because these claims "...encompass large numbers of materials that would not be in accord with the description of the invention set forth in the originally filed specification." Applicants thank the Examiner for the suggestion to conform these claims to the scope of paragraph [0008]. Applicants have made a good faith attempt, by the current amendments, to do just that. Applicants believe the amendments to Claims 34-39 obviate the rejection under 35 U.S.C. § 112.

Claims 1-15, 30 and 31 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wolter (PG Pub. No. 2003/0217790). Applicants respectfully traverse this rejection. The specifications and descriptions in the present inventions define a eutectically derived alloy composition that has a congruent or invariant combination of Hf, Cu, and Ni, forming a fixed chemical subset, which in turn, determines the overall

properties and behavior of the quinary amorphous alloy. This is defined in Paragraphs 8 and 24 of the specification. Unlike typical amorphous alloy, as exemplified in Figure 1, that undergoes incongruent melting behavior, the invention delineates a family of new alloys that undergoes congruent, or invariant, melting. Recognize the flat baseline and lack of the prominent high temperature tail for the alloy presented in Figure 2.

The teachings of the prior art, presented previously or now, relate to the formation of amorphous alloys only by the adjustment and juxtaposition of elemental constituents. That is, a simple alloying of elements in the specified atomic percentage ranges, i.e., by the manipulation of a, b, c, d, and e. These manipulations do not consistently lead to an amorphous object under the fabrication methods identified in either Wolter or Xing. However, an amorphous object results if the ratios of a, b, c, d, and e relative to one another are fixed.

The teachings of Wolter describe the limitations and difficulty associated with the fabrication of Zr/Hf-based amorphous alloys (defined by Lin U.S. Patent 5,735,975) unless high purity metallic constituents are used. As such, Wolter demonstrates that commercial, lower grade purity metals can not be used to process fully amorphous Zr-based alloys; the resultant alloys are partially crystalline, with limitations. The basis of the current invention is the use of an in-situ impurity getterer, i.e., yttrium. The intent of yttrium is required to remove oxygen introduced from varied sources into the melt prior to quenching to a mostly amorphous solid.

Unlike that disclosed in the present application, Wolter does not define the manner or the requirement wherein the relative ratio of the elemental components need to be fixed with respect to each other to produce an amorphous structure with an improved glass forming ability, as measured by the reduced glass transition temperature. A further aspect of the present invention that does not follow from the teachings of Wolter is the interaction chemistry between Hf-Cu-Ni that is non-obvious from that of Zr-Cu-Ni. In fact, only conjectures are made regarding the use of Hafnium-based glasses. There is no specific example including hafnium. No example is offered wherein an Hf-based amorphous alloy is produced by the method described. Because of the chemical dissimilarities between Zr and Hf, any Hf-based alloy with 45% Hf would not form into

an amorphous object. See the attached Declaration for the differences between hafnium and zirconium. The upper limit of 45% Hf in the current invention stems from the inability to form an amorphous object if that limit is exceeded. This is further exacerbated by the chemistry of the primary constituents of Hf, Cu, and Ni. This fact also differentiates the present invention from that of Wolter.

Applicants provide a Declaration under 37 C.F.R. § 1.132 by Laszlo J. Kecske that testifies that he either conducted or had the experiments shown in the original Application conducted and this data presented in the instant Application is accurate to the best of his knowledge. In view of the above arguments, and the attached Declaration the instant claims are not obvious from the teachings of Wolter and the claims should be allowed.

1. Claims 1-8, 11-15, 30 and 31 are rejected under 35 U.S.C. § 103(a) over Xing et al. (PG Pub. 2002/0036034). Applicants respectfully traverse this rejection in part based on the reasons stated above and the following arguments. Although Xing teaches broadly about metallic glasses, the specific examples and charts exemplify only Zirconium. Some of the broad generic combinations alleged to be covered by Xing may encompass some of the specific compositions of the instant application but, there is no recognition of the special properties taught in the instant application for the metallic glasses created by the specific ratios of the instant application. The teachings of Xing do not present or reveal any chemical interaction of any type in the metallic glass alloy formulations. The focus of the invention relates to improving the plasticity of the alloy.

The incorporation of any element into an amorphous alloy formulation alters the chemical balance between the existing species that leads to a *de facto* destabilization of the glass forming ability of the alloy composition. In fact, Ta is known to form chemical species with the majority of the components in Hf-based alloy system. The formation of such intermetallic species will result in a significant alteration and shift of the delicate balance and chemical kinetics of stabilized undercooling that occurs during the vitrification process. Therefore, use and presence of additional chemical elements or a concurrent change of their relative abundance constitutes a paramount shift away from the glass forming region in composition space. Applicants have shown by the above

discussion and the accompanying Declaration that Xing does not render the specific hafnium metallic glass alloys of the instant Application obvious and the rejection should be withdrawn.

Claims 1-39 are provisionally rejected on the ground of non-statutory obviousness-type double patenting over Claims 152-160 of co-pending Application No. 10/946,132. This provisional rejection creates an interesting situation. As shown by recently filed assignments, the instant application is owned by the United States Government as represented by the Secretary of the Army. The instant application was filed first. The invention herewith serves as the underpinnings of a multifaceted research program initiated at the U.S. Army Research Laboratory to improve a tungsten-based kinetic energy projectile. The conflicting invention was the outcome of an outsourced U.S. Army sponsored research effort, undertaken at the completion of the alloy development project and the later filed application is filed by and partially owned by another.

The current application relates to the chemically unique nature of the eutectic-type invariant-point-based metallic glass forming alloy composition, the spirit of the co-pending application, 10/946,132, relates to the fabrication of bulk components from monolithic alloy compositions as well as their composite derivatives thereof. As such, the incident claims and those of the claims of '132, i.e., 152-154, are mutually exclusive as relate to considerably larger monolithic products that could not be fabricated using the methods described in the current application. Dependent claims 155-157 do not define the process how the Hf-based alloy is obtained. However, dependent claims 158-160 do define the Hf-based alloy composition as one of the eutectically derived alloys in the current application. The other application was developed and owned in part by another with assistance from one of the inventors herein under a joint research agreement funded by the U.S. Army. The other invention is an improvement and specific application of the instant invention. This provisional double patenting rejection is not proper and should be withdrawn.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case. The Director is hereby authorized to charge any additional fees or underpayments

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Inventor: Kecske et al.
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under 37 C.F.R. § 1.16 & 1.17; and credit any overpayments to Deposit Account No. **19-2201** held in the name of U.S. Army Materiel Command.

Respectfully submitted for Applicants,
Intellectual Property Counsel
U.S. Army Research Laboratory

By


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